



WHITE PAPER

BUSY PEOPLE LOVE LEFTOVERS: A COMMUNITY-BASED SOCIAL MARKETING CAMPAIGN TO REDUCE FOOD WASTE IN DENVER, CO

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ABSTRACT

In the United States, households are collectively the largest generator of food waste, more than grocery stores and restaurants combined. However, evidence-based strategies for reducing household food waste are largely undocumented. The City and County of Denver Department of Public Health & Environment, in partnership with the Natural Resources Defense Council, conducted and evaluated a community-based social marketing (CBSM) campaign entitled “Busy People Love Leftovers” that sought to reduce household food waste by prompting people to eat leftover food instead of throwing it away. The campaign consisted of intervention packets—including an informational booklet describing the impact of food waste and tips to prevent food from becoming waste at home, an erasable fridge magnet and marker to list leftovers, and “Eat this first” clings to attach to containers of leftovers—that were mailed to households in the adjacent neighborhoods of Montbello and Green Valley Ranch in Northeast Denver. Evaluation included surveys on behaviors, attitudes, and impressions of the campaign interventions as well as multiple audits of trash contents in bins set out at the curb. The outcome suggests that social marketing materials may help consumers consider eating leftovers instead of throwing them away, thus helping them reduce their food waste.

INTRODUCTION

Up to 40 percent of all food in the United States is lost or wasted each year along with the embedded resources used to produce and process it including water, nutrients, energy, labor, and money (Buzby and Hyman 2012). Food waste is tightly interconnected with a multitude of environmental and social concerns including climate change, nutrition, and hunger (Shukla et al. 2019). Preventing food loss and waste has substantial potential to draw down global greenhouse gas emissions (Project Drawdown 2020). Preventing food from going to waste reduces the cost of purchasing, handling, and, ultimately, disposing of food that is not eaten and is the most ecologically beneficial management practice related to food waste (EPA 2015).

Food is lost or wasted at every stage of the food supply chain: on farms; during processing, distribution, and storage; in retail stores and food service operations; and finally, in households. In the United States, household food waste is responsible for more than 40 percent of the nation’s total food waste (ReFED 2021). The U.S. Environmental Protection Agency estimates that households generate 26.5 million tons of waste food each year, for an average household total of 422 pounds of food waste (EPA 2023). While businesses are often motivated to reduce their food waste as a financial and brand benefit, households have been harder to move to action, making them a prime target for our research (ReFED; Hanson and Mitchell 2017).

Leftovers—that is, foods prepared in excess of the amount that can be consumed in one meal—are among the most commonly tossed type of edible food in households (Hebrok and Boks 2017; Hoover 2017; Cox and Downing 2007). Our study targeted leftover food waste because of its discard frequency, high resource input prior to disposal, and clear opportunity for an alternative behavior compared to other frequently wasted household foods. (People already know that leftovers are edible, while significant education is required to properly store vegetables or change social norms about eating foods perceived as inedible, such as vegetable stems.)

Evidence-based strategies for preventing household food waste are largely undocumented, particularly strategies intended to aid minority communities (Schneeman and Oria 2020). The primary aim of our project was to evaluate the effectiveness of “Busy People Love Leftovers,” a community-based social marketing (CBSM) campaign prompting Denver residents to eat leftovers instead of throwing them away. CBSM principles informed the campaign, including audience research, tools alongside communication materials, and rigorous evaluation in our project design (McKenzie-Mohr et al. 2012). The City and County of Denver Department of Public Health & Environment directed the “Busy People Love Leftovers” campaign in partnership with NRDC based on findings from a 2020 National Academies of Sciences, Engineering, and Medicine report and guidance from the social marketing consulting firm Action Research (Schneeman and Oria).

Community-based social marketing (CBSM) involves four core steps: Identifying the barriers to the desired activity; Incorporating tools to change behavior; Piloting the proposal; and Evaluating effectiveness across a community (McKenzie-Mohr 2013). Barriers may be intrinsically motivated, like a lack of knowledge or motivation, or may be external to the actor, including inaccessibility or unaffordability of the desired behavior. CBSM advocates for behavior-focused campaigns that target a specific action. Some examples of tools that CBSM campaigns may utilize include: procuring a commitment to change; prompts to remember to do the activity; redefining or calling attention to social norms that guide how members of a group expect one another to behave; communications from credible sources that emphasize personal connections; and incentives that are highly visible and connected to the positive behavior. Once a pilot is evaluated and methodologies are strengthened as needed, a CBSM campaign can be rolled out to a larger community.

MATERIALS AND METHODS

The campaign consisted of food waste intervention packets that were mailed to 600 households in the adjacent neighborhoods of Montbello and Green Valley Ranch in Northeast Denver in February 2021. The intervention packets included an informational booklet describing the impact of food waste and tips to prevent food from becoming waste at home, an erasable fridge magnet and marker to list leftovers, and “Eat this first” clings to attach to containers of leftovers (Fig 1). The materials were mailed in envelopes indicating that they came from the Denver Department of Public Health & Environment.

FIG 1.



Intervention materials a) 4-page booklet including social norming, a CBSM tool to draw attention to socially expected behaviors, and information about how to save time and money by eating leftovers. The booklet describes the included tools: instructions to organize a refrigerator; b) an engagement prompt in the form of an erasable refrigerator magnet with space to list leftovers and accompanying marker; and c) 3 clings in different shapes and sizes to attach to the outside of containers of leftovers to draw attention to items that need to be eaten soonest.

The neighborhoods where this study occurred are linguistically and racially diverse. 61% of Montbello residents and 41% of Green Valley Ranch residents speak Spanish as their primary and/or only language (Census Bureau 2019). Due to the high number of Spanish speakers, the intervention materials were bilingual, with some materials presenting both English and Spanish side-by-side and some materials provided in duplicate with a version in English and a second copy in Spanish.

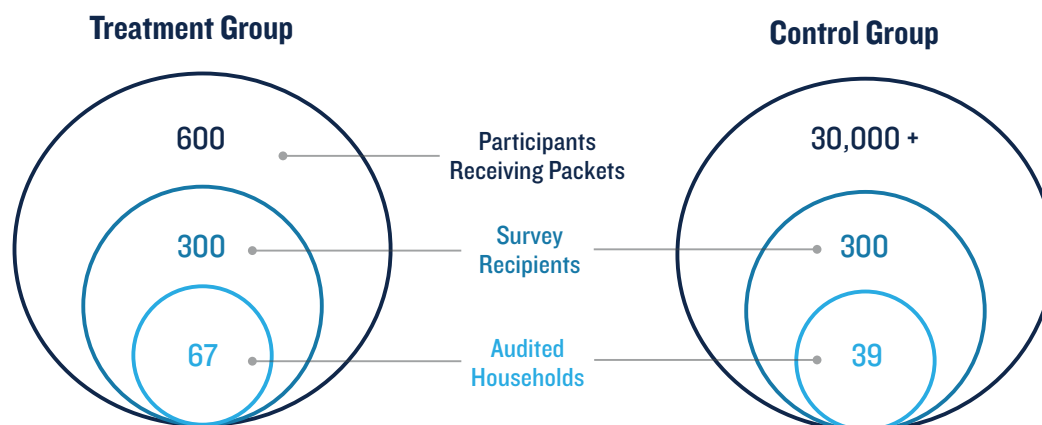
The current literature highlights the need to enhance inclusion of low-income participants in food waste reduction projects (Schneeman and Oria). To meet this need, we chose an economically diverse study area and reached out to low-income participants. 21% of Montbello's households and 6% of Green Valley Ranch households are below the federal poverty limit, compared with 12% for Denver as a whole and 10.5% for the nation (Census Bureau).

The evaluation of the effectiveness of the intervention consisted of two study arms:

SURVEY STUDY

600 households in Denver were selected for the survey study including 300 survey treatment households, selected from the 600 households that received the food waste intervention packets, and 300 survey control households that did not receive the intervention packets (Table 1). Households were selected based on geographic cluster sampling. Two weeks after the intervention packets were mailed, participants in both the treatment and the control groups received a survey querying attitudes and behaviors about food waste. For the treatment group, the survey also queried impressions about the intervention materials they received. The survey responses of the treatment group were compared with the responses of the control group to assess the impact of the intervention on attitudes and behaviors about food waste. Because the sample size was small and there were different numbers of participants and unequal variances across groups and survey responses, medians were reported as measures of central tendency, interquartile ranges (IQRs) as measures of dispersion, and Mood's median test was applied to compare group medians.

FIG 2.



Study participants comparing numbers of households in each group for the treatment and control for each portion of the study within the total population of the study neighborhoods.

FOOD AUDIT SUB-STUDY

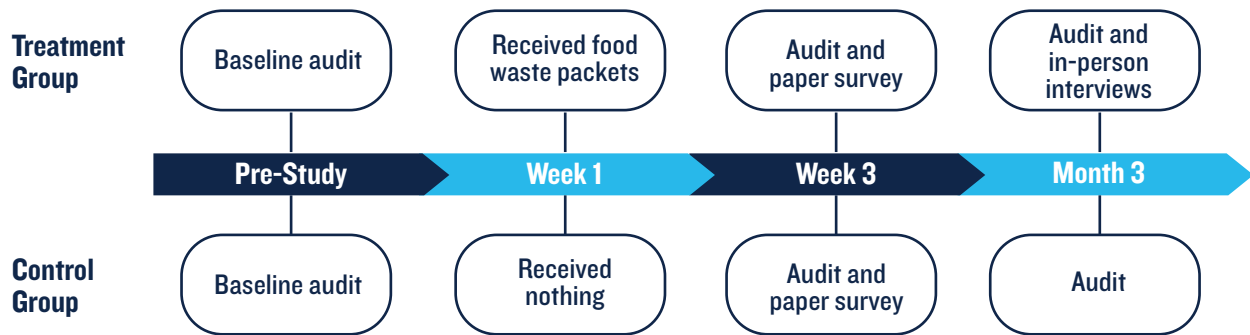
Because food is intrinsically tied to culture, values, and lifestyle image, self-reported behavior in surveys may not be representative of actual behaviors with regard to food and waste (Hebrok and Boks; Schanes, Dobernig, and Gözet 2018). Various studies have documented that consumers underreport their food waste by more than 40% (Hoover; Quested 2013). For this reason, we attempted to supplement our surveys with waste audits.

A subset of the survey study participants was selected for the audit study. The audit included 106 households for which baseline food waste measurement and at least one follow-up food waste measurement were collected, with 67 treatment households (a subset of the survey study treatment households) and 39 controls (a subset of the survey study controls). In designing the audit portion of the study, more households were selected for auditing, but many residents did not put out their trash bins on a regular basis, which further limited our sample size.

To establish the baseline measurement, an independent auditor collected trash (and compost if present) bins from the curb from both treatment and control households. Once waste is set on the curb in Denver, it becomes the property of the City; therefore, the research team was able to collect and audit the contents without participants' knowledge. For all study participants, total food waste was recorded (pounds/household), which was defined as the sum of the following food categories: inedible food scraps; meat and fish; dairy and eggs; vegetables and fruit; baked goods; dry foods; snacks, condiments, and other miscellaneous items; liquids, oils, and grease; leftovers or cooked, prepared items; unidentifiable food. Non-food waste (pounds/household) was also recorded for all participants.

Following the baseline audit, the treatment group received the food waste intervention packets as described in the Materials and Methods section above, while the control group received nothing. Two weeks later, a second food waste audit was conducted at the households of both groups. At that time, both groups received the survey as described in the Survey Study section above. Three months after the second audit, a third and final food waste audit was conducted to see whether differences in food waste behaviors between the treatment and the control groups persisted months after the intervention.

FIG 3.



Study timeline *comparing activities at each stage for the treatment control groups.*

The treatment group was compared to the control group to assess the impact of the intervention materials on all food waste as well as specifically on leftovers/cooked/prepared foods (hereafter, “leftovers”) identified during the two follow-up audits. A comparison analysis was also run on the treatment homes only, using the treatment home baseline as the control and comparing all food waste and leftovers at baseline versus two weeks and three months post-intervention. Since the food waste data was not normally distributed, medians were reported as measures of central tendency, interquartile ranges (IQRs) as measures of dispersion, and Mood’s median test was applied to compare group medians.

POST-STUDY INTERVIEWS

After the study concluded, we followed up by knocking on all 600 doors of study participants from the treatment group. The participants who answered the door were asked “Did you receive the materials about the Busy People Love Leftovers Campaign?” and shown a copy of the intervention materials. Participants could answer “No,” “Yes and used the materials,” “Yes but did not use the materials,” or could decline to answer.

RESULTS

SURVEY STUDY

Of the 300 surveys mailed to each group, 49 (16.3%) participants in the control group and 27 (9.0%) participants in the treatment group returned the survey (Table 1). The median scores self-reported by the treatment group indicated fewer food-wasteful attitudes and behaviors compared with the control group on 7 of the 13 survey questions designed to collect participants' food waste attitudes and behaviors (Table 2). While most of these between-group differences were not statistically significant, the question most relevant to the study—"In the past two weeks, how often have you eaten leftovers? 0 (never) to 10 (very often)"—showed a statistically significant difference between the treatment group (median = 10.0, IQR = 2.0) and the control group (median = 8.0, IQR = 5.0) ($p = 0.02$).

TABLE 1. DESCRIPTIVE SUMMARY OF DATA FROM SURVEYS COMPLETED BY STUDY PARTICIPANTS

	Control Participants	Treatment Participants
Surveys mailed #	300	300
Surveys returned # (% of mailed)	49 (16.3%)	27 (9.0%)
Completed in English # (% of returned)	47 (95.9%)	22 (81.5%)
Completed in Spanish # (% of returned)	2 (4.1%)	5 (18.5%)
Median Age (Range)	62 (31 - 90)	55 (29 - 87)
Male # (% of returned)	17 (34.7%)	5 (18.5%)
Female # (% of returned)	28 (57.1%)	18 (66.7%)
Median # Adults in Household	2	2
Median # Children in Household	0	1
Most Common Reported Income	\$25,000 - <\$50,000	\$50,000 - <\$75,000
American Indian or Alaska Native # (% of returned)	2 (4.1%)	1 (3.7%)
Asian # (% of returned)	2 (4.1%)	2 (7.4%)
Native Hawaiian or Pacific Islander # (% of returned)	0	0
Hispanic or Latino/a/x # (% of returned)	10 (20.4%)	13 (48.2%)
Black or African American # (% of returned)	22 (44.9%)	6 (22.2%)
White # (% of returned)	16 (32.7%)	9 (33.3%)
Other Race # (% of returned)	3 (6.1%)	1 (3.7%)

Not every participant answered every survey question on age, gender, number of people in household, income, and race/ethnicity. Participants could select more than one race/ethnicity option.

TABLE 2. COMPARISON OF TREATMENT TO CONTROL SURVEY RESPONSES

Question	# Control Responses	# Treatment Responses	Control Median	Control IQR	Treatment Median	Treatment IQR	Significant difference (medians) ($p \leq 0.05$)?
How important is it to not throw away any food? 0 (not at all) to 10 (extremely)	49	27	9.0	3.0	9.0	5.0	No
How successful are you at not throwing away any food? 0 (not at all) to 10 (extremely)	49	27	7.0	3.0	7.0	3.0	No

TABLE 2. (CONTINUED) COMPARISON OF TREATMENT TO CONTROL SURVEY RESPONSES

Question	# Control Responses	# Treatment Responses	Control Median	Control IQR	Treatment Median	Treatment IQR	Significant difference (medians) (p≤ 0.05)?
In the past two weeks, how often have you thrown out fruit? 0 (never) to 10 (very often)	49	27	3.0	4.0	2.0	2.5	No
In the past two weeks, how often have you thrown out veggies? 0 (never) to 10 (very often)	48	27	2.5	4.0	2.0	3.0	No
In the past two weeks, how often have you thrown out dairy products? 0 (never) to 10 (very often)	49	27	1.0	2.0	0.0	2.5	No
In the past two weeks, how often have you thrown out leftovers? 0 (never) to 10 (very often)	49	26	3.0	4.0	3.0	3.0	No
In the past two weeks, how often have you thrown out meat? 0 (never) to 10 (very often)	49	27	2.0	5.0	1.0	2.0	No
In the past two weeks, how often have you put food that will spoil faster in easy to see place? 0 (never) to 10 (very often)	48	27	8.0	3.0	8.0	5.5	No
In the past two weeks, how often have you labeled leftovers w date or food type? 0 (never) to 10 (very often)	48	26	1.0	4.0	1.0	8.8	No
In the past two weeks, how often have you eaten leftovers? 0 (never) to 10 (very often)	44	25	8.0	5.0	10.0	2.0	Yes
In the past two weeks, how often have you repurposed leftovers into a new meal? 0 (never) to 10 (very often)	48	27	6.0	8.0	9.0	5.5	No
In the past two weeks, how often have you prepared meals based on what was going to go bad first? 0 (never) to 10 (very often)	47	27	8.0	4.0	8.0	5.0	No
In the past two weeks, how often have you removed and threw away only the bruised parts of fruits and vegetables instead of throwing away the whole thing? 0 (never) to 10 (very often)	48	27	8.0	4.3	9.0	4.5	No

Green highlights questions where the treatment group median was “better” than the control group (i.e., indicative of wasting less food or of more highly valuing reducing food waste).

Survey respondents who reported receiving the intervention materials found at least some of them to be helpful (Table 3). 20.0% of survey treatment respondents reported receiving the materials but not using them. Of those who self-reported using the materials (N = 8), all reported using the fridge magnet, half reported using the “Eat this first” clings, and 37.5% reported using the information booklet. Respondents reported that the program helped their household to a) eat all of their leftovers, b) reduce food waste, and c) organize their fridge. The participant who used the materials but gave the lowest results for a) and c) commented, “I try not to waste, [but another member of the household] rarely eats leftovers.”

TABLE 3. RESPONSES TO TREATMENT-SPECIFIC SURVEY QUESTIONS

Question	# Treatment Responses	Treatment Median	Treatment IQR
Did you receive materials about the Busy People Love Leftovers Campaign? Yes, and we used them Yes, but we did not use them No	26 8 (30.8%) 2 (7.7%) 16 (61.5%)		
Busy People Love Leftovers helped my household to eat all our leftovers: 0 (not at all) to 10 (very much so)	9	9.0	6.5
Busy People Love Leftovers helped my household to reduce food waste: 0 (not at all) to 10 (very much so)	9	9.0	4.5

TABLE 3. (CONTINUED) RESPONSES TO TREATMENT-SPECIFIC SURVEY QUESTIONS

Question	# Treatment Responses	Treatment Median	Treatment IQR
Busy People Love Leftovers helped my household to organize our fridge: 0 (not at all) to 10 (very much so)	9	10.0	5.5
The program booklet was helpful: 0 (not at all) to 10 (very much so)	9	9.0	6.5
The program booklet was easy to understand: 0 (not at all) to 10 (very much so)	9	10.0	3.5
The fridge magnet (leftover list) was helpful: 0 (not at all) to 10 (very much so)	9	10.0	4.0
The fridge magnet (leftover list) was easy to understand: 0 (not at all) to 10 (very much so)	9	10.0	4.0
The Eat This First signage was helpful: 0 (not at all) to 10 (very much so)	9	10.0	7.0
The Eat This First signage was easy to understand: 0 (not at all) to 10 (very much so)	9	10.0	7.5

The survey included options to complete online or by mail. For three households in the control group we received two survey responses, one electronically and one by mail. We included all of these survey responses in the reported results, as different surveys originating from a single household reported different values for some survey questions, which could reflect the individual attitudes and behaviors of multiple members of the surveyed household. Notably, dropping the survey responses for the addresses for which we received both an electronic and a paper survey did not change the survey analytical results.

FOOD WASTE AUDIT SUB-STUDY

At the baseline audit (audit 1) there were no statistically significant differences in median food waste weights between the treatment and control groups (Table 4). While the treatment group showed consistently lower median results for all food waste than the control group across audits, none of the differences were statistically significant. There was no clear trend in differences in median leftover food waste comparing treatment and control groups at each audit.

TABLE 4. COMPARISON OF TREATMENT AND CONTROL AUDIT RESULTS

		Treatment Group			Control Group			Significant difference (medians) ($p \leq 0.05$)?
		N (#)	Median (pounds)	IQR (pounds)	N (#)	Median (pounds)	IQR (pounds)	
All food waste	Baseline	67	9.6	10.8	39	9.8	16.0	No
	Follow-up 1	59	12.0	14.4	35	13.3	16.0	No
	Follow-up 2	61	10.9	9.7	37	19.5	25.9	No
Leftover food waste	Baseline	67	1.7	3.6	39	2.6	4.3	No
	Follow-up 1	59	1.8	4.7	35	1.5	2.8	No
	Follow-up 2	61	0.7	2.2	37	1.7	5.1	No

Green highlights outcomes where the treatment group median showed less food waste than the control group, and red highlights outcomes where the treatment group median showed more food waste than the control group.

When the treatment group's food waste weights at first follow-up (audit 2; two weeks after intervention) were compared with the group's food waste weights at baseline (audit 1; pre-intervention), there was an increase but no statistically significant difference in both all food waste ($p = 0.11$) and leftover waste weight ($p = 0.59$) (Table 4). When the second follow-up (audit 3; three months after intervention) was compared to baseline, there was a non-significant increase in median overall food waste weight ($p = 0.39$) and a decrease in leftover food waste weight ($p = 0.01$) (Table 4).

POST-STUDY INTERVIEWS

In the post-study interviews, 201 of the 600 participants that received the materials answered the door. In response to the question "Did you receive the materials about the Busy People Love Leftovers Campaign?" most ($n = 125$, 62.2%) reported that they did not receive the materials. 44 (21.9%) reported that they received and used the materials, while 23 (11.4%) reported that they received but did not use the materials. Nine people (4.5%) gave null or alternative responses.

DISCUSSION

Though small, our study suggests that social marketing materials may help consumers consider eating leftovers instead of throwing them away, contributing to a reduction in food waste. The differences in survey responses around eating leftover food in particular suggest that the materials included in our study helped participants remember to eat leftovers instead of wasting them.

Survey respondents who used the materials overwhelmingly reported positive attitudes toward their usefulness; nearly all gave scores of 9 or 10 out of 10 indicating “very much so.” They reported that the campaign helped their households organize their refrigerators, eat all of their leftovers, and reduce their households’ food waste. All three intervention components—the booklet, magnet, and clings—were reported to be helpful and easy to understand. The leftover list fridge magnet was the most popular of the materials, with nearly all respondents giving it top marks.

Of the eight respondents who self-reported using the materials, half responded to the survey in Spanish and half in English, with positive responses from nearly all respondents; thus, we believe the intervention was successful in both languages. Additionally, 22% and 28% of residents in Montbello and Green Valley Ranch, respectively, are Black or African American (Census Bureau). The high rate of survey responses from people identifying as African American or Black (44.9% of the control and 22.0% of the treatment group) suggests that our outreach plan, including the principles of community-based social marketing, was successful in reaching Black and African American members of these communities.

Survey respondents were representative of an array of annual household income levels (from less than \$25,000 to more than \$75,000) and varying household sizes, with no discernible differences in response to the intervention attributable to socio-economic indicators. Future studies can continue to investigate and refine the CBSM approach in neighborhoods with different and varying demographics.

LIMITATIONS

Our study had several limitations. The audit results were limited by assessing only the waste in bins placed curbside; we may have missed other disposal streams including food sent down the drain, fed to animals, disposed at another location, or composted at home. In the free comment section of the survey, some respondents mentioned backyard chickens and worm composting as alternative disposal destinations that they use. Audit results were also impacted by irregularity in taking bins to the curb. The baseline audit was particularly impacted by an overnight heavy snowstorm that delayed city services and likely deterred residents from putting out their trash for collection; at baseline audit, only 72.26% of bins were set out prior to pickup. The reduced number of households with a baseline audit reduced the number of potential participants in both the treatment and control groups. For homes that had baseline audits and thus were included in the study, 18.87% missed one of the two follow-up audits due to not putting out their trash bins for collection. Thus, these snapshot-in-time audits may not reflect a uniform amount of food waste per pickup. Rather, it is probable that some of the audits included multiple weeks’ worth of food waste or outlier trash collection that was heavier or lighter than standard.

Additionally, the audits may have been limited by imprecision in measurement. Weights were recorded in tenths of a pound, rather than a more precise and smaller unit, which may have limited our ability to see true differences in food waste weights between groups. Furthermore, human judgment was part of the process for sorting waste and individual determinations were made as to how to categorize food types. While best efforts were made to remove food from packaging, it was not always possible. Due to the limitations of the audit study, we hesitate to place too much emphasis on the audit collection results of our study. Future studies might refine the audit collection process to obtain more precise results. For example, reporting weights in grams or fractions of an ounce may resolve finer details in food waste behaviors.

The relatively low rate of participation in Denver’s city-wide composting program in the Montbello and Green Valley Ranch neighborhoods may limit the extrapolation of the audit results to other neighborhoods. At the time of the study, Denver’s compost program was an opt-in, fee-for-service program. Along with compost collection, enrolled residents receive additional communication from the city including a newsletter and waste prevention information. Residents with more frequent communication about how to reduce food waste may already be primed for waste reduction activities, which may affect assessment of the utility of the interventions or magnitude of impact on household food waste.

While the analysis of our survey results assumed that all participants in the treatment group received the intervention packet, the post-study interviews suggested that only one-third of interviewees had received (or were aware of receiving) the materials. Of the interviewees who confirmed receiving the intervention, most (67.53%) reported using the materials. However, it is conceivable that subjects who did not use the sticker and/or the magnet still read and were influenced by the

intervention packet's information on food waste. Even subjects who received but did not read the intervention materials may have been influenced by simply receiving the packets. Within the confines of our study, we were unable to assess what level of participant engagement with the intervention materials (if any) was associated with changes in food waste attitudes or behaviors.

CONCLUSION

Our results share some commonalities and differences with previous survey results in the literature on attitudes, motivations, and behaviors. On average, survey respondents reported low occurrence of throwing away all types of food queried (fruit, veggies, dairy, leftovers, and meat) but survey respondents on average gave a higher score (thrown away more often) to leftovers than they did to veggies and fruit. This differs from Neff, Spiker, and Truant (2015)'s finding that respondents perceived themselves as throwing away more fruits and vegetables than “homemade meals”—though we asked about frequency rather than quantity. We also found a high percentage (31.08%) of respondents who reported close to never (0, 1, or 2 on a score up to 10) throwing away food in all five categories (similar to Neff, Spiker, and Truant, which reported 37%).

Given these attitudes and behaviors, we echo the recommendation that future studies investigate the effectiveness of interventions designed to help households keep track of and prioritize eating of leftovers and previously prepared meals. For example, the intervention tools like those used in the “Busy People Love Leftovers” campaign might be investigated in study areas of differing language, social, economic, racial, and cultural factors to assess whether these tools are broadly effective or whether they should be employed for more targeted populations.

Our study found that participants who used the intervention tools reported that they were helpful in reducing food waste. The refrigerator magnet tool to help list leftovers was the most highly rated and shows the most promise for future propagation. Overall, participants showed great interest in the topic of food waste and left overwhelmingly positive comments appended to the surveys. These comments included participants' tips for reducing food waste and their desires for companies and institutions to reduce their food waste or help consumers reduce food waste at home. Many commented on their appreciation for the city's efforts to reduce food waste, including one participant who remarked, “I will pay more attention to what I throw away. Thank you!”

KEY TAKEAWAYS

We offer the following recommendations and lessons for future studies measuring food waste behavior change in households:

Interactive interventions are valued by households, including diverse audiences that are often left out of research such as Spanish-speaking and Black or African American households in our sample region. Both the informational booklets and the interactive interventions (the magnetic leftover list and the clings) were well received by both English- and Spanish-speaking survey respondents across varying demographics.

Blinded, snapshot-in-time, curbside waste audits may not be a useful indicator of waste habits. Although they are viewed as the gold standard because of their comprehensive nature, waste audits at the curb may not tell a straightforward tale about weekly waste behaviors. We chose not to notify residents about the audits in advance so that they would not change their behaviors. However, that made for difficult sampling because many households did not set out their bins for collection when we sampled. We concluded that setting out garbage every week may not be a standard behavior in all houses, which means that blinded audits from the curb may not reflect a uniform amount of food waste per pickup. Rather, it is probable that some of the audit samples included multiple weeks' worth of food waste.

Mailed materials must be very visually appealing. Many survey respondents said that they did not receive our materials in the mail, although the post carrier reported that nearly all materials were delivered. We concluded that many participants did not open the materials or materials were opened and discarded by a different member of the household than completed the survey. Future studies should emphasize the importance of any mailed interventions. The outside of the envelope should be very eye-catching and attractive to residents.

Door-to-door engagement may be the best way to reach households with characteristics like our sample. In-person survey sampling had a much higher rate of response than paper or electronic surveys did in our study. Door knocking was not excessively expensive compared with postage but had a much higher rate of return. We concluded that door-to-door engagement was a better mechanism for engaging and receiving feedback from residents. Furthermore, door-to-door engagement could be expanded beyond the survey component of the study to include more information sharing and participant feedback at the outset.

Some households are tossing enormous quantities of food, including edible foods and other items that researchers could not determine any flaw in. Despite our knowledge of the shocking statistics about how much food is wasted in the U.S., we were still surprised by the very large quantities of food (i.e. greater than 50 pounds) found in some garbage bins that seemed to be of perfectly good quality to the researchers. We were further resolved in our work to educate and engage households about the value of saving food and finding alternative means of preserving, sharing, and ultimately consuming food rather than dumping it in the garbage.

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